The Higher Ministry of Nature: viewed in the Light of Modern Science, and as an Aid to Advanced Christian Philosophy. By John R. Leifchild. (London: Hodder and Stoughton, 1872.)

MR. LEIFCHILD is already known as a careful writer on matters connected with economic geology; he now appears before the public in the avowed character of ambassador between the opposing forces of Theology and Science. This bulky volume of upwards of 500 pages appears to be a kind of commonplace-book of thoughts which have occurred to him in solitary wanderings; the title means to express that the author concerns himself with subjects higher than those which "subserve our present individual and collective interests." We must acknowledge that works of this kind, endeavouring to reconcile in detail the conflicting theories of theologians and men of science, are little to our taste; we suppose, however, they have their public; and in the case of the volume before us, the large type, wide margins, and handsome binding, are all in its favour. With this preliminary objection, that portion of Mr. Leifchild's work which comes within our scope—for the greater part does not—seems treated with considerable care and knowledge, and with a higher degree of impartiality than is usually to be met with in such works. The Darwinian doctrines of evolution and natural selection of course come in for some severe criticism; we are surprised that Mr. Leifchild should reiterate the superficial and often refuted objection that geology has not yet revealed a single fossil *in transitu* from one species to another, as if it were possible that geology should reveal anything but the successive connecting and connected links, which it has done, and is doing every day. Those who delight in speculations on the border-land between the natural and the supernatural will find much to interest them in the volume, and to such we commend it.

LETTERS TO THE EDITOR

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. No notice is taken of anonymous communications.*]

Spectroscopic Nomenclature

YOUR columns were not long since opened to a discussion, rather long drawn out, on a point of nomenclature. They are now, as ever, open to all reasonable discussion on that most interesting aspect of Nature presented by the spectroscope. I cannot help thinking that some advance might be made if the faculties exhibited in the one were now brought to bear on the other. There seems to be a lamentable tendency in zealous but disorderly minds to pay as little attention as possible to those aids to reasoning—those signs of ideas, which ought to be current coin.

I do not in the least propose to myself to attempt to mount the breach just now. But I would fain challenge attention, and urge a fair amount of consideration, on some few points in which I have noticed very diverse methods of expressing the same thing. And in so doing I may find it necessary to give my voice in favour of one or the other. But it is not my object to advocate so much as to indicate.

Observations have recently been made of the sun during eclipse of a kind which, if not so novel as some think, is intensely interesting, and must be constantly referred to. I mean with a free prism. Now it occurs to me that it would be easy to reserve the spectroscope for that instrument which we have been accustomed to call such and to characterise these other observations as *prismatic*, as distinct from *spectroscopic*. It would then be known at the very outset that there was no slit. This would not prevent a juvenile disciple of Newton from repeating his prismatic examination of a chink, and getting his linear spectrum; it would only keep before him the origin and constitution of that spectrum in a way which the sole use of the spectroscope appears not to do. The prismatic and the spectroscopic methods of examining a luminous object are totally distinct. Thus the Poodocottah observations were of one kind, those at Dodabetta of the other; those at Bekul, of both. It is of no consequence, for this matter, where the prism is, it is the absence of the slit that makes the difference. Thus, for the purpose of illustration, I may allude to the planetary nebula seen *prismatically* unaffected in the midst of a star cluster turned into streaks. And the prominences seen in an open slit are to all intents seen prismatically. It is obvious that there is here a distinction of idea which may be advantageously fixed by a distinctive use of words. Let the spectroscope mind its own business, which is to make and examine linear spectra. The moment it ceases to do so it ceases to be a spectroscope.

This brings me to the next point. Since the prism does not require a slit,—on the contrary, is a very valuable tool, as we have seen, without,—it ought never to see *lines*, except as it sees other forms, *i.e.*, out lines. There is a confusion of ideas—rather, I should say, a contraction of ideas—in setting a prism to look for lines. It is the spectroscope which sees lines, the prism sees images, forms. It is an accident of the case if the form happens in any of its parts to be at the same time linear, and having its linear portion in a certain direction. Thus, when in a prismatic examination of the solar crescent immediately before eclipse, the cusps become linear—albeit curvilinear—there is a failure of grasp in speaking of the dark cusp-images as dark lines; or, at any rate, there is an opportunity lost of exemplifying the principle which pervades the whole of the phenomenon, and of fixing the prismatic idea.

The same kind of misuse of terms I have had occasion to point out on the occasion of the first prismatic examination of an eclipse, when what are now called, happily, zones, were unhappily and mistakenly called by the technical term "bands."

I now pass on to the confusion which exists in the nomenclature of lines. The subject fully treated would embrace the whole range of spectral analysis; but I must confine what I have to say to solar spectra.

In the early days of solar examination with the spectroscope, I made my venture, in the direction which I am now pursuing, and it failed. Ignorant that I was already distanced—no matter how or why—I suggested certain symbols for certain lines, foreseeing somewhat of what has come to pass. Aiming to avoid an affiliation which further knowledge might prove false, but admitting the great probability that the lines at C, F, 2796 (K) were really due to hydrogen, I would have called these solar bright lines α, β, γ, the hydrogen lines being already known as Hα, Hβ, Hγ; that which is now variously called "D_3," "D^3," "near D," or sometimes plain "D," I would have had known, in the same category, as δ. And other Greek letters expressed, and would have sufficed to express, as many more as the memory would require to hold. The venture failed, as I say; and considering that no little confusion has resulted, I cannot help thinking it a pity that it did. Soon after appeared a work on spectrum analysis, in which Hγ is ignored, and the bright solar line which corresponds with 2796 (K) and with Hγ is persistently called and identified with G, to the great scandal of the ghost of Fraunhofer and (I doubt not) the living Plücker. The blunder has often been repeated since, indeed I have seen it in NATURE more than once in the last few days. If it was not to have a Greek letter, at least it had a better right to be known as "2796 (K)" than has the coronal line to be called "1474 (K)." Failing that, it has been paraphrased, the shortest form being "near G." Surely it is time this were put right.

And now we have "1474." No one knows what the true position of that line is. The line 1474 (K) is an iron line, and it is to the last degree improbable that the coronal line is identical with it. The misnomer has carried with it, naturally, the idea that the source is iron. As this is an improbability of a higher order still—because there is evidence against it in the absence of a few hundred other iron lines—a false idea is in process of being fixed.

And all this arises, and much more will follow, from the laziness of mind, if I may so call it without offence, which adopts a name belonging to something already, instead of first reserving judgment, and giving it an independent standing with a name of its own.

Then there is the confusion of idea, and uncertainty in understanding exactly what is intended in speaking of the extension of the spectrum, and of position in it, as right and left, or left and right, as the case may be; or the confusion is avoided by the precise but cumbersome reference to degree of refrangibility, This is quite unnecessary. This is so exact an analogy between the *degree* of refrangibility and the *degree* of heat that no one

©1872 Nature Publishing Group

ought to experience the least difficulty in using the simple adjectives "higher" or "upper" and "lower" for the parts of the spectrum, and the simple prepositions "above" and "below," where required. There is no possibility of misconception, and no explanation is needed.

Probably we have got beyond the stage in which misconception is likely to arise from the careless use of words expressing continuity or otherwise in a spectrum; but I would suggest the word "diffuse" where it is not intended to express anything precise. Thus the coronal spectrum is diffuse until we know it to be solar. M. Janssen testifies to dark lines seen in the (diffuse) spectrum.

J. HERSCHEL

Camp Nandair, Hyderabad, March 19

Turner's Vision

I HAVE been waiting since the appearance of a report of Dr. Liebreich's lecture in NATURE of March 21 expecting that an animated discussion would be provoked, affording me an opportunity of slipping in obscurely as a minor combatant, the subject being one on which I am but very indifferently qualified to speak, although thirteen years ago I did incidentally suggest an explanation of the peculiarities of Turner's later pictures which, simple as it is, still appears to me sufficient. On page 67 of "Through Norway with a Knapsack," published in 1859, speaking of some of the peculiar midnight sunset effects of the North, I said that "Turner, like an eagle, has dared to face the sun in his full glare, and to place him in the middle of his pictures, showing us how we see a landscape with sun-dazzled eyes, when everything is melted into a luminous chaos, and all the details blotted out with misty brightness."

In all these peculiar pictures that I have seen the sun is thus placed in the middle of the picture, and just sufficiently above the horizon (from about 10° to 20°, or at most 25°) to pour his rays about perpendicularly to the curvature of the eye-ball, when the face is in position to contemplate a landscape. I have frequently repeated the experiment of contemplating a landscape under such circumstances, and on every occasion of submitting to such torture have seen all the effects of even the most extravagant of Turner's later pictures, which are so well described by Dr. Liebreich. I have seen the "vertical streakiness, which is caused by every illuminated point having been changed into a vertical line," with an "elongation, generally speaking, in exact proportion to the brightness of the light," and that "there proceeds from the sun, in the centre of the picture, a vertical yellow streak." These appearances may arise from an affection of the crystalline lens of my eye similar to that attributed by Dr. Liebreich to Turner, or it may be due to something else much simpler, and which is more or less common to all human eyes. If the simpler explanation based upon normal conditions covers the facts, it certainly must be the more acceptable.

My explanation of the vertical streaks is this. When we thus look full faced at the sun, the dazzle produces slight inflammation or irritation, and a flow of tears. The liquid accumulates, and rests upon the lower eyelid, forming a little pool, the surface of which has a considerable vertical curvature, *i.e.* the lower part of the retained tear curves upwards from the surface of its base at the root of the lower eyelashes to its summit contact with the conjunctiva. Thus in a vertical direction it must act as a lens of very short focus, it must refract and converge the rays of light in a vertical plane, and thus produce a vertical magnifying effect, the definition of which will of course be very confused and obscure, on account of the irregular curvature, and the fact that the eye is focused to the distant objects. This want of directive focusing will limit the distortion to the bright objects whose vertically magnified images will be forced upon the attention.

To test this explanation let any one select a bright afternoon, and at about 6 P.M. or a little later, at this season, gaze sunward upon any landscape free from London smoke or other medium of solar obscuration. At first, if his eyes are not very sensitive, he will see a circular sun, but presently, as the tears accumulate, the vertical elongation of the sun and general "vertical streakiness" will appear. When I tried the experiment last week the sun appeared like a comet with a brilliant vertical conical tail, the point of which rested on the horizon. But I was then slightly troubled with what is called "a cold in the head," and my eyes watered very vigorously, and thus the conditions for producing fine Turneresque effects were highly favourable. On carefully drying my eyes these effects were, for a moment, considerably diminished.

I have adopted another method of testing this explanation. Having caused the eyes to become somewhat suffused, I bring the upper and lower eyelids so near together that the liquid shall occupy a sensible depth, *i.e.*, from the conjunctiva to the base of both upper and lower eyelashes, and by compression be bulged or curved outwards in the vertical direction. On looking through this tear-filled chink at a gaslight, the vertical elongation is remarkably displayed, and it extends upwards or downwards or both according to the position of the liquid. When looking at the sun and landscape with the eyes fully opened (which is very painful), the elongation is chiefly downwards, and obviously connected with the tear on the lower eyelid; but if the eyelids be nearly closed to diminish the intensity of the light, an upward elongation is also commonly visible.

The other phenomena represented by Turner are, I think, simply a faithful copying of the effects of glare and suffusion produced by painful sun-gazing and the looking at a landscape where the shadows are, so to speak, nowhere, or all behind one's back.

W. MATTIEU WILLIAMS

The Adamites

As "M. A. I." prefers to keep his incognito, I shall not seek further to induce him to reveal himself. He has now, however, pointed out what he conceives to be errors in my paper, and I will reply to his criticism.

In the first place, as to the word *pi-ta*, I neither said nor inferred that the final syllable is not a suffix. My remark was that it retained a primitive root, *ta*, which is found also in the Semitic *'ata*, and I submit still that I am perfectly correct. The suffix *târ* in Sanskrit denotes nouns of agency, as Bopp shows in his "Comparative Grammar," and I am quite justified, when I find in various other languages a root word similar both in sound and sense, in inferring that the Sanskrit suffix was originally of the same character. I have hitherto been under the impression that comparative philology had established that suffixes were at one time independent words, but it appears that I am wrong. To show, however, that I have erred in good company, I would refer to Prof. Max Müller's "Stratification of Language" (p. 32), where it is said, "suffixes and affixes were all independent words, nominal, verbal, or pronominal; there is, in fact, nothing in language that is now empty, or dead, or formal, that was not originally full, and alive, and material." I must plead guilty of ignorance of "M. A. I.'s" scientific method.

As to *Taata*, when it is shown that *Tamata* or *Tangata* was the original form of the Polynesian deity's name, I shall be better able to reply to your correspondent's criticism. In any case, the final syllable is evidently the word denoting "spirit," and I see no difficulty in *Ta* becoming either *Tam* or *Tang* as the result of phonetic change. The mere fact that *Taata* and *Tiki* are different gods with different attributes really amounts to nothing, since such a division of personality and characteristics is a common fate of the divinities of heathen mythologies. I see no reason to change my opinion that the name of the Polynesian great ancestor has preserved the same primitive root as that which is to be found in the name of the first man, Adam, of the Semites, or rather of the *Akkad* forerunners.

While replying to "M. A. I.," it may be well to notice the criticism of his advocate, Mr. Jenkins, for whose explanation of the meaning of the word *Adam* I am much obliged, although, if he will take the trouble to read my paper, he will see that I was not ignorant of what he states. But the acceptance of the Hebrew meaning of the word as the original one does not lead me to place much reliance on Mr. Jenkins's judgment. If the Old Testament narrative proves anything beyond a knowledge of the tradition as to Adam, it is that the narrator was a bad philologist, and that finding the Hebrew word *adamah*, he forthwith inferred that the first man was made of ground-dust, which gave to him its red colour. For my part, I entirely ignore the authority on such a point of the Hebrew writer, and in justification I beg to refer to the statement made by the Rev. A. H. Sayce before the Society of Biblical Archæology, as reported in the last number of NATURE (p. 495), that the early Semitic traditions are derived from an Akkadian source, as are also most of the biliteral roots of the Semitic language. If the traditions are taken from that source, the probability is that the proper names they enshrine have had the same origin; and I submit, therefore, that I am quite justified in tracing the meaning of the word Adam to the old Chaldean tongue, in which, as Mr. Norris's Assyrian dictionary shows, and as my paper asserts, *Ad* signifies "a father."

©1872 Nature Publishing Group